

SEQUENCE LISTING

110> Wang, Liaoteng Wickens, Marvin P. Kimble, Judith E.

<120> Regulatory poly(A) polymerase and uses thereof

<130> 960296.99314

<140> 10/665,797 <141> 2003-09-18

<150> 60/411,685

<151> 2003-09-18

<160> 12

<170> PatentIn version 3.2

<210> 1

<211> 345

<212> PRT

<213> Homo sapiens

<400> 1

His Ile Tyr Thr Gln Lys Leu Ile Asp Ala Met Lys Pro Phe Gly Val 20 25 30

Phe Glu Asp Glu Glu Leu Asn His Arg Leu Val Val Leu Gly Lys 35 40 45

Leu Asn Asn Leu Val Lys Glu Trp Ile Ser Asp Val Ser Glu Ser Lys 50 55 60

Asn Leu Pro Pro Ser Val Val Ala Thr Val Gly Gly Lys Ile Phe Thr 65 70 75 80

Phe Gly Ser Tyr Arg Leu Gly Val His Thr Lys Gly Ala Asp Ile Asp 85 90 95

Ala Leu Cys Val Ala Pro Arg His Val Glu Arg Ser Asp Phe Phe Gln 100 105 110

Ser Phe Phe Glu Lys Leu Lys His Gln Asp Gly Ile Arg Asn Leu Arg 115 120 125

Ala Val Glu Asp Ala Phe Val Pro Val Ile Lys Phe Glu Phe Asp Gly 130 135 140

Ile Glu Ile Asp Leu Val Phe Ala Arg Leu Ala Ile Gln Thr Ile Ser 150 155 145 Asp Asn Leu Asp Leu Arg Asp Asp Ser Arg Leu Arg Ser Leu Asp Ile 170 165 Arg Cys Ile Arg Ser Leu Asn Gly Cys Arg Val Thr Asp Glu Ile Leu 185 His Leu Val Pro Asn Lys Glu Thr Phe Arg Leu Thr Leu Arg Ala Val Lys Leu Trp Ala Lys Arg Gly Ile Tyr Ser Asn Met Leu Gly Phe 215 210 Leu Gly Gly Val Ser Trp Ala Met Leu Val Ala Arg Thr Cys Gln Leu 225 230 Tyr Pro Asn Ala Ala Ala Ser Thr Leu Val His Lys Phe Phe Leu Val Phe Ser Lys Trp Glu Trp Pro Asn Pro Val Leu Leu Lys Gln Ser Glu 260 265 270 Glu Ser Asn Leu Asn Leu Pro Val Trp Asp Pro Arg Val Asn Pro Ser 275 280 Asp Arg Tyr His Leu Met Pro Ile Ile Thr Pro Ala Tyr Pro Gln Gln 290 295 300 Asn Ser Thr Tyr Asn Val Ser Thr Ser Thr Arg Thr Val Met Val Glu 305 Glu Phe Lys Gln Gly Leu Ala Val Thr Asp Glu Ile Leu Gln Gly Lys . 330 Ser Asp Trp Ser Lys Leu Leu Glu Pro 340 <210> 2 <211> 345 <212> PRT

<213> Drosophila melanogaster

<400> 2

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Tyr Pro Asn Ala Ala Ala Thr Leu Val His Lys Phe Phe Leu Val 245 250 255

Phe Ser Arg Trp Lys Trp Pro Asn Pro Val Leu Leu Lys His Pro Asp 260 265 270

Asn Val Asn Leu Arg Phe Gln Val Trp Asp Pro Arg Val Asn Ala Ser 275 280 285

Asp Arg Tyr His Leu Met Pro Ile Ile Thr Pro Ala Tyr Pro Gln Gln 290 295 300

Asn Ser Thr Phe Asn Val Ser Glu Ser Thr Lys Lys Val Ile Leu Thr 305 310 315 320

Glu Phe Asn Arg Gly Met Asn Ile Thr Asp Glu Ile Met Leu Gly Arg 325 330 335

Ile Pro Trp Glu Arg Leu Phe Glu Ala 340 345

<210> 3

<211> 345

<212> PRT

<213> Saccharomyces cerevisiae

<400> 3

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1 10 15

Asn Lys Leu Asn Asp Ser Leu Ile Gln Glu Leu Lys Lys Glu Gly Ser 20 25 30

Phe Glu Thr Glu Gln Glu Thr Ala Asn Arg Val Gln Val Leu Lys Ile 35 40 45

Leu Gln Glu Leu Ala Gln Arg Phe Val Tyr Glu Val Ser Lys Lys 50 55 60

Asn Met Ser Asp Gly Met Ala Arg Asp Ala Gly Gly Lys Ile Phe Thr 65 70 75 80

Tyr Gly Ser Tyr Arg Leu Gly Val His Gly Pro Gly Ser Asp Ile Asp 85 90 95

Thr Leu Val Val Pro Lys His Val Thr Arg Glu Asp Phe Phe Thr 100 105 110

Val Phe Asp Ser Leu Leu Arg Glu Arg Lys Glu Leu Asp Glu Ile Ala Pro Val Pro Asp Ala Phe Val Pro Ile Ile Lys Ile Lys Phe Ser Gly 140 -Ile Ser Ile Asp Leu Ile Cys Ala Arg Leu Asp Gln Pro Gln Val Pro Leu Ser Leu Thr Leu Ser Asp Lys Asn Leu Leu Arg Asn Leu Asp Glu Lys Asp Leu Arg Ala Leu Asn Gly Thr Arg Val Thr Asp Glu Ile Leu Glu Leu Val Pro Lys Pro Asn Val Phe Arg Ile Ala Leu Arg Ala Ile Lys Leu Trp Ala Gln Arg Arg Ala Val Tyr Ala Asn Ile Phe Gly Phe Pro Gly Gly Val Ala Trp Ala Met Leu Val Ala Arg Ile Cys Gln Leu Tyr Pro Asn Ala Cys Ser Ala Val Ile Leu Asn Arg Phe Phe Ile Ile Leu Ser Glu Trp Asn Trp Pro Gln Pro Val Ile Leu Lys Pro Ile Glu Asp Gly Pro Leu Gln Val Arg Val Trp Asn Pro Lys Ile Tyr Ala Gln Asp Arg Ser His Arg Met Pro Val Ile Thr Pro Ala Tyr Pro Ser Met Cys Ala Thr His Asn Ile Thr Glu Ser Thr Lys Lys Val Ile Leu Gln Glu Phe Val Arg Gly Val Gln Ile Thr Asn Asp Ile Phe Ser Asn Lys Lys Ser Trp Ala Asn Leu Phe Glu Lys

<210> 4

<211> 349

<212> PRT

<213> Caenorhabditis elegans

<400> 4

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Ile Ala Gl
n Thr Leu Leu Ile Glu Thr Leu Lys Lys Phe Gly Ser 20 25 30

Tyr Glu Pro Lys Glu Glu Thr Glu Gln Arg Met Glu Val Leu Arg Asn 35 40 45

Leu Asn Arg Leu Val Lys Glu Trp Val Lys Asn Val Thr Ala Met Lys 50 55 60

Ile Pro Asn Gly Glu Gly Val Asn Ala Gly Gly Lys Leu Phe Thr Phe 65 70 75 80

Gly Ser Tyr Arg Leu Gly Val His Ser Ser Gly Ala Asp Ile Asp Thr 85 90 95

Leu Ala Val Val Pro Arg His Ile Asp Arg Ser Asp Phe Phe Thr Ser 100 105 110

Phe Lys Glu Met Leu Asn Asn Asp Pro Asn Val Thr Glu Leu His Gly
115 120 125

Val Glu Glu Ala Phe Val Pro Val Met Lys Leu Lys Tyr Ser Gly Val 130 135 140

Glu Leu Asp Ile Leu Phe Ala Arg Leu Ala Leu Lys Glu Val Pro Asp 145 150 155 160

Thr Gln Glu Leu Ser Asp Asp Asn Leu Leu Arg Asn Leu Asp Gln Glu
165 170 175

Ser Val Arg Ser Leu Asn Gly Cys Arg Val Ala Glu Gln Leu Lys 180 185 190

Leu Val Pro Arg Gln Lys Glu Phe Cys Val Thr Leu Arg Ala Ile Lys 195 200 205

Leu Trp Ala Lys Asn His Gly Ile Tyr Ser Asn Ser Met Gly Phe Phe 215 Gly Gly Ile Thr Trp Ala Ile Leu Val Ala Arg Ala Cys Gln Leu Tyr 230 235 Pro Asn Ala Ser Pro Ser Arg Leu Val His Arg Met Phe Phe Ile Phe 250 245 Ser Thr Trp Thr Trp Pro His Pro Val Val Leu Asn Glu Met Asn Asn 265 Asp Arg Asn Asp Ile Pro Thr Leu Cys Glu Leu Val Trp Asp Pro Arg 280 Arg Lys Asn Thr Asp Arg Phe His Val Met Pro Ile Ile Thr Pro Ala 290 295 Phe Pro Glu Gln Asn Ser Thr His Asn Val Thr Arg Ser Thr Ala Thr 310 315 320 305 Val Ile Lys Asn Glu Ile Cys Glu Ala Leu Glu Ile Cys Arg Asp Ile 330 325 Ser Glu Gly Lys Ser Lys Trp Thr Ala Leu Phe Glu Glu 340 <210> 5 <211> 388 <212> PRT <213> Caenorhabditis elegans <400> 5 Arg Gly Phe Ala Ser Pro Ser Pro Pro Thr Ser Leu Leu Ser Glu Pro 10 Leu Ser Arg Met Asp Val Leu Ser Glu Lys Ile Trp Asp Tyr His Asn 25 Lys Val Ser Gln Thr Asp Glu Met Leu Gln Arg Lys Leu His Leu Arg Asp Met Leu Tyr Thr Ala Ile Ser Pro Val Phe Pro Leu Ser Gly Leu Tyr Val Val Gly Ser Ser Leu Asn Gly Phe Gly Asn Asn Ser Ser Asp 70 75

Met Asp Leu Cys Leu Met Ile Thr Asn Lys Asp Leu Asp Gln Lys Asn Asp Ala Val Val Leu Asn Leu Ile Leu Ser Thr Leu Gln Tyr Glu Lys Phe Val Glu Ser Gln Lys Leu Ile Leu Ala Lys Val Pro Ile Leu Arg Ile Asn Phe Ala Ala Pro Phe Asp Asp Ile Thr Val Asp Leu Asn Ala Asn Asn Ser Val Ala Ile Arg Asn Thr His Leu Leu Cys Tyr Tyr Ser Ser Tyr Asp Trp Arg Val Arg Pro Leu Val Ser Val Val Lys Glu Trp Ala Lys Arg Lys Gly Ile Asn Asp Ala Asn Lys Ser Ser Phe Thr Ser Tyr Ser Leu Val Leu Met Val Ile His Phe Leu Gln Cys Gly Pro Thr Lys Val Leu Pro Asn Leu Gln Gln Ser Tyr Pro Asn Arg Phe Ser Asn Lys Val Asp Val Arg Thr Leu Asn Val Thr Met Ala Leu Glu Glu Val Ala Asp Asp Ile Asp Gln Ser Leu Ser Glu Lys Thr Thr Leu Gly Glu Leu Leu Ile Gly Phe Leu Asp Tyr Tyr Ala Asn Glu Phe Asn Tyr Asp Arg Asp Ala Ile Ser Ile Arg Gln Gly Arg Arg Val Glu Arg Ala Ala Leu Ala Val Arg Pro Lys Ile His Ser Asn Ser Glu Gly Asp Lys Glu Thr Pro Pro Pro Ser Ser Ser Ala Ser Thr Ser Ser Ile His Asn

Gly Gly Thr Pro Gly Ile Pro Met His His Ser Ile Ser Asn Pro His

Phe Trp Arg Ser Gln Trp Arg Cys Val Cys Ile Glu Glu Pro Phe Thr

Asn Ser Asn Thr Ala His Ser Ile Tyr Asp Glu Met Val Phe Glu Ala

Ile Lys Lys Ala Phe Arg Glu Ala His Gly Glu Leu Gln His Asn His

Asp Leu Asp Lys

<210> 6 <211> 387 <212> PRT

<213> Caenorhabditis elegans

<400> 6

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Val Ser Gln Thr Asp Glu Met Leu Gln Arg Lys Leu His Leu Arg Asp

Met Leu Tyr Thr Ala Ile Ser Pro Val Phe Pro Leu Ser Gly Leu Tyr

Val Val Gly Ser Ser Leu Asn Gly Phe Gly Asn Asn Ser Ser Asp Met

Asp Leu Cys Leu Met Ile Thr Asn Lys Asp Leu Asp Gln Lys Asn Asp

Ala Val Val Leu Asn Leu Ile Leu Ser Thr Leu Gln Tyr Glu Lys

Phe Val Glu Ser Gln Lys Leu Ile Leu Ala Lys Val Pro Ile Leu Arg

Ile Asn Phe Ala Ala Pro Phe Asp Asp Ile Thr Val Asp Leu Asn Ala Asn Asn Ser Val Ala Ile Arg Asn Thr His Leu Leu Cys Tyr Tyr Ser Ser Tyr Asp Trp Arg Val Arg Pro Leu Val Ser Val Val Lys Glu Trp Ala Lys Arg Lys Gly Ile Asn Asp Ala Asn Lys Ser Ser Phe Thr Ser Tyr Ser Leu Val Leu Met Val Ile His Phe Leu Gln Cys Gly Pro Thr Lys. Val Leu Pro Asn Leu Gln Gln Ser Tyr Pro Asn Arg Phe Ser Asn Lys Val Asp Val Arg Thr Leu Asn Val Thr Met Ala Leu Glu Glu Val Ala Asp Asp Ile Asp Gln Ser Leu Ser Glu Lys Thr Thr Leu Gly Glu Leu Leu Ile Gly Phe Leu Asp Tyr Tyr Ala Asn Glu Phe Asn Tyr Asp Arg Asp Ala Ile Ser Ile Arg Gln Gly Arg Arg Val Glu Arg Ala Ala Leu Ala Val Arg Pro Lys Ile His Ser Asn Ser Glu Gly Asp Lys Glu Thr Pro Pro Pro Ser Ser Ser Ala Ser Thr Ser Ser Ile His Asn Gly Gly Thr Pro Gly Ile Pro Met His His Ser Ile Ser Asn Pro His Phe 330 335 Trp Arg Ser Gln Trp Arg Cys Val Cys Ile Glu Glu Pro Phe Thr Asn 340 345 350 Ser Asn Thr Ala His Ser Ile Tyr Asp Glu Met Val Phe Glu Ala Ile

Lys Lys Ala Phe Arg Glu Ala His Gly Glu Leu Gln His Asn His Asp 375 370 Leu Asp Lys 385 <210> 7 <211> 336 <212> PRT <213> Mus musculus <400> 7 Glu Ile Pro Leu Glu Pro Arg Glu Ile Thr Leu Pro Glu Ala Lys 10 Asp Lys Leu Ser Gln Gln Ile Leu Glu Leu Phe Glu Thr Cys Gln Gln Gln Ala Ser Asp Leu Lys Lys Glu Leu Cys Arg Ala Gln Leu Gln Arg Glu Ile Gln Leu Leu Phe Pro Gln Ser Arg Leu Phe Leu Val Gly Ser Ser Leu Asn Gly Phe Gly Ala Arg Ser Ser Asp Gly Asp Leu Cys Leu Val Val Lys Glu Glu Pro Cys Phe Phe Gln Val Asn Gln Lys Thr Glu Ala Arg His Ile Leu Thr Leu Val His Lys His Phe Cys Thr Arg 105 Leu Ser Gly Tyr Ile Glu Arg Pro Gln Leu Ile Arg Ala Lys Val Pro 115 120 Ile Val Lys Phe Arg Asp Lys Val Ser Cys Val Glu Phe Asp Leu Asn 135 Val Asn Asn Thr Val Gly Ile Arg Asn Thr Phe Leu Leu Arg Thr Tyr 150 155 Ala Tyr Leu Glu Asn Arg Val Arg Pro Leu Val Leu Val Ile Lys Lys 165 170

Trp Ala Ser His His Asp Ile Asn Asp Ala Ser Arg Gly Thr Leu Ser

185

Ser Tyr Ser Leu Val Leu Met Val Leu His Tyr Leu Gln Thr Leu Pro 200 Glu Pro Ile Leu Pro Ser Leu Gln Lys Ile Tyr Pro Glu Ser Phe Ser 215 Thr Ser Val Gln Leu His Leu Val His His Ala Pro Cys Asn Val Pro 230 235 225 Pro Tyr Leu Ser Lys Asn Glu Ser Ser Leu Gly Asp Leu Leu Gly 250 245 Phe Leu Lys Tyr Tyr Ala Thr Glu Phe Asp Trp Asn Thr Gln Met Ile 265 260 Ser Val Arq Glu Ala Lys Ala Ile Pro Arg Pro Asp Asp Met Glu Trp 280 275 285 Arg Asn Lys Tyr Ile Cys Val Glu Glu Pro Phe Asp Gly Thr Asn Thr 290 295 300 Ala Arg Ala Val His Glu Lys Gln Lys Phe Asp Met Ile Lys Asp Gln 305 310 315 320 Phe Leu Lys Ser Trp Gln Arg Leu Lys Asn Lys Arg Asp Leu Asn Ser 325 330 <210> 8 <211> 336 <212> PRT <213> Homo sapiens <400> 8 Glu Ile Ala Phe Leu Glu Pro Arg Glu Ile Thr Leu Pro Glu Ala Lys Asp Lys Leu Ser Gln Gln Ile Leu Glu Leu Phe Glu Thr Cys Gln Gln 25 Gln Ile Ser Asp Leu Lys Lys Glu Leu Cys Arg Thr Gln Leu Gln Arg Glu Ile Gln Leu Leu Phe Pro Gln Ser Arg Leu Phe Leu Val Gly 55

Ser Ser Leu Asn Gly Phe Gly Thr Arg Ser Ser Asp Gly Asp Leu Cys Leu Val Val Lys Glu Glu Pro Cys Phe Phe Gln Val Asn Gln Lys Thr Glu Ala Arg His Ile Leu Thr Leu Val His Lys His Phe Cys Thr Arg 105 100 Leu Ser Gly Tyr Ile Glu Arg Pro Gln Leu Ile Arg Ala Lys Val Pro 120 Ile Val Lys Phe Arg Asp Lys Val Ser Cys Val Glu Phe Asp Leu Asn 135 Val Asn Asn Ile Val Gly Ile Arg Asn Thr Phe Leu Leu Arg Thr Tyr 155 Ala Tyr Leu Glu Asn Arg Val Arg Pro Leu Val Leu Val Ile Lys Lys 170 Trp Ala Ser His His Gln Ile Asn Asp Ala Ser Arg Gly Thr Leu Ser 180 Ser Tyr Ser Leu Val Leu Met Val Leu His Tyr Leu Gln Thr Leu Pro 195 Glu Pro Ile Leu Pro Ser Leu Gln Lys Ile Tyr Pro Glu Ser Phe Ser 210 Pro Ala Ile Gln Leu His Leu Val His Gln Ala Pro Cys Asn Val Pro 230 225 Pro Tyr Leu Ser Lys Asn Glu Ser Asn Leu Gly Asp Leu Leu Gly Phe Leu Lys Tyr Tyr Ala Thr Glu Phe Asp Trp Asn Ser Gln Met Ile 260 Ser Val Arg Glu Ala Lys Ala Ile Pro Arg Pro Asp Gly Ile Glu Trp 275 280 285 Arg Asn Lys Tyr Ile Cys Val Glu Glu Pro Phe Asp Gly Thr Asn Thr 300

Ala Arg Ala Val His Glu Lys Gln Lys Phe Asp Met Ile Lys Asp Gln 310 315 Phe Leu Lys Ser Trp His Arg Leu Lys Asn Lys Arg Asp Leu Asn Ser 325 330 <210> 9 <211> 357 <212> PRT <213> Caenorhabditis elegans <400> 9 Ile Ala Gly Ser Val Glu Lys Phe Val Asn Ser Ile Thr Lys Lys Ser Phe Asn Ser Val Lys Gln Leu Ser Lys Leu Ala Trp Asp His Tyr Leu 25 Gly Asn Ala Gln Pro Asp Phe Val Phe Leu Lys Lys Met Glu Ala Arg Gln Lys Leu Phe Ser Glu Ile Lys Lys Leu Phe Pro Asp Thr Glu Ile Lys Leu Gln Thr Thr Gly Ser Thr Val Asn Gly Cys Gly Ser Phe Asn Ser Asp Met Asp Leu Cys Leu Cys Phe Pro Thr Asn Gly Tyr Lys Gly Gln Val Cys Asp Asp Phe His Cys Asp Arg Asn Tyr Ser Thr Lys Ile 105 100 Leu Arg Lys Ile Asp Lys Ala Phe Arg Arg Ser His Trp Ser His Pro 120 Leu Lys Lys Ile Ile Lys Thr Met Gln Leu Val Pro Ala Lys Val Pro 135 130 Ile Val Lys Met Ile Leu Asn Gly Glu Phe Asp Gly Ile Glu Val Asp 155 145 150 Ile Asn Val Asn Asn Ile Ala Gly Ile Tyr Asn Ser His Leu Ile His 170 165 Tyr Tyr Ser Leu Thr Asp Ala Arg Leu Pro Ala Leu Ala Leu Leu Val

185

180

Lys His Trp Ala Met Val Thr Gly Ile Asn Asn Ala Gln Asp Gly Phe 200 195 Leu Asn Ser Tyr Thr Thr Ile Leu Leu Val Val His Tyr Leu Gln Cys 215 Gly Val Thr Pro Ala Val Ile Pro Asn Leu Gln Tyr Leu Phe Pro His 235 240 225 230 Lys Phe Asp Arg Lys Leu Pro Leu Asn Glu Leu Leu Phe Gly Asp 245 250 Ile Ala Asp Lys Leu Pro Thr Ser Pro Pro Asn Thr Trp Ser Leu Gly 265 260 Glu Leu Leu Ile Gly Phe Phe Gln Tyr Tyr Asn Glu Phe Asp Phe Thr 275 Asn Phe Gly Phe Ser Ile Arg Ser Gly Gln Val Ile Pro Arg Glu Asn 295 290 Leu Pro Arg Asp Leu Ile Asn Ser Pro Ile Val Val Glu Glu Pro Phe 310 315 305 Asp Ala Ile Asn Thr Ala Arg Thr Val Arg Asp Val Ser His Met Lys 330 325 Ser Ile Lys Ser Ala Phe Arg Cys Ala Val Gln Ile Ile Ser Ser Asn 345 340 Lys Asn Phe Thr Met 355 <210> 10 <211> 332 <212> PRT <213> Arabidopsis thaliana

Gln Lys Ala Arg Met Val Lys Met Tyr Met Ala Cys Arg Asn Asp Ile

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<400> 10

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Lys Arg Glu Lys Asp Trp Thr Arg Arg Val Gly Asn Asp Arg His Leu 280 Ile Cys Ile Glu Asp Pro Phe Glu Thr Ser His Asp Leu Gly Arg Val 295 Val Asp Lys Phe Ser Ile Arg Val Leu Arg Glu Glu Phe Glu Arg Ala 310 315 305 Ala Arg Ile Met His Gln Asp Pro Asn Pro Cys Ala 325 <210> 11 <211> 349 <212> PRT <213> Homo sapiens <400> 11 Pro Glu Asp Phe Lys Arg Ile Gln Leu Glu Pro Leu Pro Pro Leu Thr Pro Lys Phe Leu Asn Ile Leu Asp Gln Val Cys Ile Gln Cys Tyr Lys Asp Phe Ser Pro Thr Ile Ile Glu Asp Gln Ala Arg Glu His Ile Arg Gln Asn Leu Glu Ser Phe Ile Arg Gln Asp Phe Pro Gly Thr Lys Leu Ser Leu Phe Gly Ser Ser Lys Asn Gly Phe Gly Phe Lys Gln Ser Asp Leu Asp Val Cys Met Thr Ile Asn Gly Leu Glu Thr Ala Glu Gly Leu 85 Asp Cys Val Arg Thr Ile Glu Glu Leu Ala Arg Val Leu Arg Lys His 105 100 Ser Gly Leu Arg Asn Ile Leu Pro Ile Thr Thr Ala Lys Val Pro Ile 115 120 125 Val Lys Phe Phe His Leu Arg Ser Gly Leu Glu Val Asp Ile Ser Leu 135 130 Tyr Asn Thr Leu Ala Leu His Asn Thr Arg Leu Leu Ser Ala Tyr Ser

150

145

170 165 Thr Lys Met Cys Asp Ile Gly Asp Ala Ser Arg Gly Ser Leu Ser Ser 185 180 Tyr Ala Tyr Thr Leu Met Val Leu Tyr Phe Leu Gln Gln Arg Asn Pro 200 195 Pro Val Ile Pro Val Leu Gln Glu Ile Tyr Lys Gly Glu Lys Lys Pro 215 Glu Ile Phe Val Asp Gly Trp Asn Ile Tyr Phe Phe Asp Gln Ile Asp 225 230 235 240 Glu Leu Pro Thr Tyr Trp Ser Glu Cys Gly Lys Asn Thr Glu Ser Val 250 245 Gly Gln Leu Trp Leu Gly Leu Leu Arg Phe Tyr Thr Glu Glu Phe Asp 260 Phe Lys Glu His Val Ile Ser Ile Arg Arg Lys Ser Leu Leu Thr Thr 280 275 Phe Lys Lys Gln Trp Thr Ser Lys Tyr Ile Val Ile Glu Asp Pro Phe 290 Asp Leu Asn His Asn Leu Gly Ala Gly Leu Ser Arg Lys Met Thr Asn 305 310 315 Phe Ile Met Lys Ala Phe Ile Asn Gly Arg Arg Val Phe Gly Ile Pro 325 330 Val Lys Gly Phe Pro Lys Asp Tyr Pro Ser Lys Met Glu 340 345 <210> 12 <211> 345 <212> PRT <213> Bos taurus <400> 12 Tyr Gly Ile Thr Ser Pro Ile Ser Leu Ala Ala Pro Lys Glu Thr Asp 10

Ala Ile Asp Pro Arg Val Lys Tyr Leu Cys Tyr Thr Met Lys Val Phe

Cys Leu Leu Thr Gln Lys Leu Val Glu Thr Leu Lys Pro Phe Gly Val Phe Glu Glu Glu Glu Leu Gln Arg Ile Leu Ile Leu Gly Lys 40 Leu Asn Asn Leu Val Lys Glu Trp Ile Arg Glu Ile Ser Glu Ser Lys 55 Asn Leu Pro Gln Ser Val Ile Glu Asn Val Gly Gly Lys Ile Phe Thr 75 70 Phe Gly Ser Tyr Arg Leu Gly Val His Thr Lys Gly Ala Asp Ile Asp Ala Leu Cys Val Ala Pro Arg His Val Asp Arg Ser Asp Phe Phe Thr 100 Ser Phe Tyr Asp Lys Leu Lys Leu Gln Glu Glu Val Lys Asp Leu Arg 115 Ala Val Glu Glu Ala Phe Val Pro Val Ile Lys Leu Cys Phe Asp Gly 135 130 Ile Glu Ile Asp Ile Leu Phe Ala Arg Leu Ala Leu Gln Thr Ile Pro 150 145 Glu Asp Leu Asp Leu Arg Asp Asp Ser Leu Leu Lys Asn Leu Asp Ile Arg Cys Ile Arg Ser Leu Asn Gly Cys Arg Val Thr Asp Glu Ile Leu 180 His Leu Val Pro Asn Ile Asp Asn Phe Arg Leu Thr Leu Arg Ala Ile 200 195 Lys Leu Trp Ala Lys Arg His Asn Ile Tyr Ser Asn Ile Leu Gly Phe 210 Leu Gly Gly Val Ser Trp Ala Met Leu Val Ala Arg Thr Cys Gln Leu 225 230 240 Tyr Pro Asn Ala Ile Ala Ser Thr Leu Val His Lys Phe Phe Leu Val 250

Phe Ser Lys Trp Glu Trp Pro Asn Pro Val Leu Leu Lys Gln Pro Glu Glu Cys Asn Leu Asn Leu Pro Val Trp 280 Pro Arg Val Asn Pro Ser Asp 290 Tyr His Leu Met Pro 295 Ile Ile Thr Pro Ala Tyr Pro Gln Gln 305 Ser Thr Tyr Asn Val Ser Val Ser Thr Asp 315 Wet Val Met Val Glu 320 Glu Phe Lys Gln Gly Leu Ala Ile Thr Asp 330 Glu Ile Leu Leu Ser Lys 335 Ala Glu Trp Ser Lys 340 Pro Glu Ala 345